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COLORADO
DEPARTMENT OF NATURAL RESOURCES

Bill Ritter, Jr.
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June 28, 2010

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th St, SW
Washington, DC 20554

Subject: **Public Notice DA 10-1035**
OFFICE OF ENGINEERING AND TECHNOLOGY
REQUESTS INFORMATION ON USE OF 1675 – 1710 MHz BAND
ET Docket No. 10-123

Dear Ms. Dortch:

The State of Colorado has prepared the following comments in response to the subject Public Notice DA 10-1035 and request for information on the use of the 1675-1710 MHz band. Responses to the questions included in the Public Notice are given below.

1) Identity of the non-federal entities accessing the services operating in the 1675–1710 MHz band:

The State of Colorado operates and maintains the Colorado Satellite-Linked Water Resources Monitoring System (SMS), established in 1985, to collect and analyze data from over 500 stream and reservoir gaging stations located throughout the State. Data are transmitted from remote data collection platforms to the NOAA GOES West satellite. From the satellite, data are transmitted to various downlink sites (direct readout ground stations) across the country, the primary sites being the NOAA GOES DCS located at Wallops Island VA, and the USGS EROS Center in Sioux Falls, SD. Raw satellite data are re-broadcast via a domestic satellite service (DOMSAT) to a receive site located in Denver, where the raw data stream is captured, processed, published to a public website, and archived. Processed data are used by Colorado Division of Water Resources (and other State, Federal and local agency) staff to administer and manage water throughout the State. The US Geological Survey, other Federal agencies, and other State and local agencies use the GOES satellite for telemetry of data collected at an additional 400 gages in Colorado, all of which are used for water administration and management purposes. Satellite telemetry of remote data via the GOES satellite has proven to be highly consistent and reliable. It is the only method of data telemetry that works across the wide range of difficult topographic conditions present in Colorado and the interwoven locations from which water resources data must collected.

2) A description of the purpose of such use:

A. <u>Water Rights Administration</u>

The primary utility of the Colorado satellite-linked monitoring system is for water rights administration. The availability of real-time data from a network of key gauging stations in each major river basin in Colorado provides an overview of the hydrologic conditions of the basin that was previously not available. By evaluating real-time data for upstream stations, downstream flow conditions can typically be predicted 24 to 48 hours in advance. This becomes an essential planning tool in the hands of the Division Engineers and Water Commissioners. The "river call" can be adjusted more precisely to satisfy as many water rights as possible, even if just for short duration flow peaks caused by precipitation events. Access to real-time data makes it possible to adjust the "river call" to match dynamic hydrologic conditions. If additional water supplies are available, more junior rights can be satisfied. On the other hand, if water supplies decrease, then water use can be curtailed to protect senior rights.

The administration of water rights in Colorado is becoming increasingly more complex due to increased demands, implementation of augmentation plans, water exchanges, transmountain diversions, and minimum stream flow requirements. For example, the number of water rights has increased from 102,028 in 1982 to over 173,000 in 2007. Increasing numbers of water rights has continued to the present. Water rights transfers approved by the water courts are becoming increasingly complex. This is especially evident where agricultural water rights are transferred to municipal use.

There is considerable interest in monitoring transmountain diversions, both by western slope water users and the eastern slope entities diverting the water. Transmountain diversion water is administered under different laws than water originating in the basin. In general, this water may be claimed for reuse by the diverter until it is totally consumed. Forty transmountain diversions are monitored by the SMS.

Water exchanges between water users are becoming increasingly frequent. These exchanges can provide for more effective utilization of available water resources in high demand river basins, but can be difficult to administer. The satellite-linked monitoring system has proven to be an integral component in monitoring and accounting of these exchanges.

Many municipalities and major irrigation companies have reservoir storage rights. Generally, these entities can call for release of stored water on demand. The Division Engineer must be able to delineate the natural flow from the storage release while in the stream. He/she then must track the release and ensure that the proper delivery is made. The SMS has demonstrated to be effective in this area.

The utility of the SMS in the administration of interstate compacts is an especially important application. The State Engineer has the responsibility to deliver defined amounts of water under the terms of eleven different Interstate River Compacts and agreements, but not to over-deliver and deprive Colorado of its entitlement. Data collected from over 35 gaging stations operated by both the CO DWR and the USGS are incorporated in the Statewide monitoring network and utilized for the effective administration of these interstate compacts.

The majority of the large, senior water rights in Colorado belong to irrigation companies. These rights are often the calling right in the administration of a water district. The direct diversion rights exercised can affect significantly the hydrology of the river. Dozens of major irrigation diversions are monitored by the system.

Water rights have been acquired by federal and state agencies to guarantee minimum stream flow for both recreational and fisheries benefits. As well, instream flow water rights have been developed by the Colorado Water Conservation Board to ensure minimum instream flows are maintained in critical stream reaches around the State. The availability of real-time data is essential in ensuring that these minimum stream flows are maintained.

B. Hydrologic Records Development

The Hydrographic Branch of the Colorado Division of Water Resources develops historic streamflow records in coordination with other State and Federal entities and the water user community. At the conclusion of each water year, the State Engineer's Office compiles streamflow information and measurements conducted throughout the year for publication. Published streamflow records describe the mean daily discharge, the instantaneous maximum, lowest mean discharge, and monthly/ annual volumetric totals for a specific location on a river or stream. These annual streamflow records are computed using two critical sources of information: streamflow measurements made throughout the water year to calibrate the stage-discharge relationship at a specific site, and, the electronic record of stream stage collected by the satellite monitoring system. Using these data a continuous record of streamflow for the water year is computed. Streamflow records undergo a rigorous data quality control/quality assurance program to ensure the product is accurate. The Division of Water Resources Hydrographic program computes and publishes over 240 streamflow records annually. Published historical streamflow data are extremely valuable in support of water resources planning and management decision-making, assessment of current conditions and comparisons with historical flow data, and hydrologic modeling.

C. Water Resources Accounting

Currently, the satellite-linked monitoring system is being utilized for accounting for the Colorado River Decision Support System (CRDSS), the Colorado-Big Thompson Project, the Dolores Project, and the Fryingpan-Arkansas Project Winter Water Storage Program among others around the State. The ability to input real-time data into these accounting programs allows for current and on-going tabulations.

D. Dam Safety

Dam safety monitoring has developed in recent years into a major issue. Numerous on-site parameters are of interest to the State Engineer in assessing stability of a dam. At this time, the system monitors reservoir inflow, water surface elevation and reservoir release or outflow at more than fifty reservoirs in Colorado. These data provide a basis for evaluating current operating conditions as compared to specific operating instructions. The installation and operation of additional sensor types could provide essential data on internal hydraulic pressure, vertical and horizontal movement, and seepage rates.

3) Which portions of the 1675-1710 MHz band are used:

The GOES satellite data telemetry downlink frequency resides at 1694.5 to 1694.8 MHz in the subject band. The downlink frequency obviously cannot be changed on the spacecraft. The State of Colorado is extremely concerned that sharing of this frequency band, particularly the GOES satellite downlink frequency, may disrupt and potentially seriously compromise remote data collection and processing, and thereby its ability to manage and administer vital water resources in the State.

4) How often the service is used (*e.g.*, every day, scheduled times of day, duration, etc.):

Data are transmitted from each remote site to the GOES satellite on an hourly basis. Each site is assigned a different transmit time and time window on a specific channel. Given there are over 30,000 such assignments (NOAA GOES DCS system-wide), the GOES downlink frequency is essentially in continuous use. The Colorado SMS can also be considered to receive raw data from the GOES satellite on a near continuous basis. A few operational data processing statistics illustrate the volume of data handled by the SMS in its current configuration:

- 10,700+ satellite transmissions decoded per day
- 105,500+ data values stored per day
- 32,000+ diagnostics data values (signal strength, battery voltage, error codes, etc.) decoded per day
- 45,000+ data values from external providers processed and stored per day

5) An estimate of the current investment in wireless equipment, including when it was obtained and put into use:

It is estimated the State of Colorado has invested nearly $10 million for all remote site and receive site satellite telemetry equipment (electronic hardware and software, computer systems, satellite receive hardware, etc.) over the 25 year history (1985-2010) of its satellite monitoring network. This does not account for any stream gage station infrastructure costs, personnel costs, or costs of IT support and development to take the raw data streams and process data into understandable values for dissemination.

6) A description of whether and how the information and services currently accessed can be obtained from other means; and if so, the anticipated costs and timeframes for implementing any alternatives:

Replacement of the electronic satellite telemetry components is very difficult to estimate given there is not a single suitable alternative that will operate so consistently and reliably (as the GOES satellite) across the wide range of difficult topographic conditions present in Colorado. There may be commercial (private sector) satellite services that approach this. However, to migrate to such a system would require the data collection platform, transceiver and antenna at each remote stream gage to be replaced. As well, there would be a monthly fee per site to transmit data. Data are then made available to subscriber of such services via the Internet, calling into question whether such services can be considered equally reliable to the NOAA GOES DCS system. Internet failures have and do occur. The estimated reconfiguration cost per stream gage is $6000. Minimum total reconfiguration costs for the Colorado SMS as currently designed, including computer hardware reconfiguration is estimated to be $3.2 million. Annual service subscription fees (a new O&M cost) is estimated to be around $150,000. The program would also require significant re-tooling (hardware and training) to support the equipment reconfiguration. These costs are not included here. Also not included are the costs of installation, nor the significant costs associated with lost work efficiency and productivity, and costs of "lost (unaccounted)" water.

7) If the information currently available from the meteorological satellite service were received at only a few receive sites and distributed via terrestrial services, would this be functionally equivalent:

The Colorado SMS currently relies almost totally on the NOAA GOES satellite downlink for its water resources management. Currently, all data downlinked at the NOAA GOES DCS in Wallops Island VA and at the USGS EROS Data Center in Sioux Falls SD are streamed continuously to the Internet for "backup

purposes". The NOAA GOES DCS also currently re-broadcasts the data via a domestic satellite service (DOMSAT). So, such services already exist and Colorado has developed the infrastructure to obtain raw data from such alternate sources. The reliability of such services, especially terrestrial services such as the Internet, which often involves other parties and operators, is known to be a problem. The Internet has gone down in several recent natural disasters seriously compromising the availability of data and affecting emergency management decision making data. Direct satellite downlinks in such situations are needed and must be protected.

The State of Colorado requests the FCC to carefully evaluate the impacts of frequency sharing and/or the reduction of the numbers of direct GOES satellite downlink sites. For the reasons set forth above, we believe that key downlink stations must be fully protected from any interference created by broadband service development in or near the same frequency band as the GOES satellite downlink frequency.

Thank you for the opportunity to provide comments.

Sincerely,

Mike King
Executive Director